

FOREST SERVICE

U.S. DEPARTMENT OF AGRICULTURE

MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Juniper Control by Individual Tree Burning

Donald A. Jameson¹

For 100 percent kill of juniper trees with individual tree burning, 60 percent of the crown should be scorched. The time required to achieve enough scorch increased with wind and tree size, but decreased with temperature.

Because juniper trees have reduced the forage production on millions of acres of western rangelands, many ranchers and land management agencies are conducting juniper control programs. Burning individual trees is one suitable technique for killing junipers.

Where to Use Individual Tree Burning

Individual tree burning is best suited to open stands of small, nonsprouting trees such as one-seed juniper (*Juniperus monosperma* (Engelm.) Sarg.) and Utah juniper (*J. osteosperma* (Torr.) Little). Travel between widely scattered trees is fairly rapid² (fig. 1) and small trees are quickly burned² (fig. 2). Large trees, however, require so much time to burn that the expense becomes prohibitive. Individual tree burning is not appropriate for trees over 10 feet tall, nor should it be used for

sprouting species such as alligator juniper (*J. deppeana* Steud.) and redberry juniper (*J. pinchotii* Sudw.).

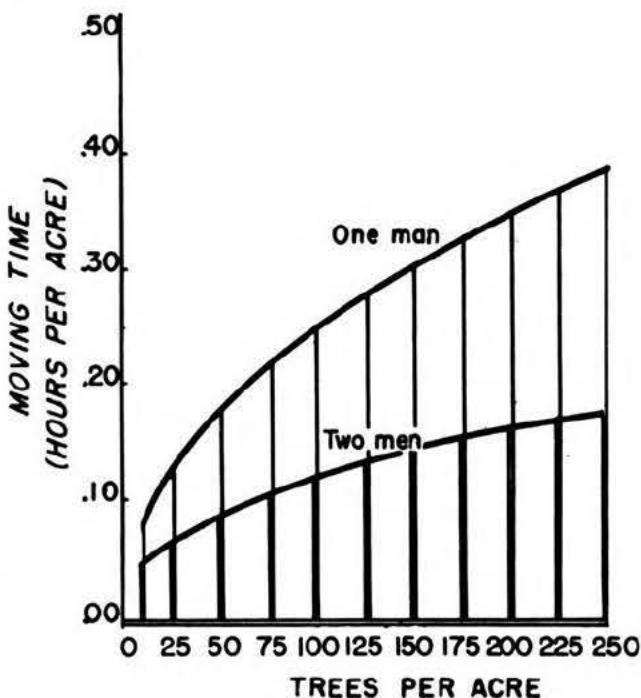


Figure 1.--Moving time per acre for burning trees individually with one- and two-man crews.

¹ Principal Plant Physiologist, located at Flagstaff, in cooperation with Northern Arizona University; central headquarters maintained at Fort Collins, in cooperation with Colorado State University.

² Data for figures 1 and 2 from-- Cotner, Melvin L., and Jameson, Donald A. Costs of juniper control: Bulldozing vs. burning individual trees. U. S. Forest Serv. Rocky Mountain Forest and Range Exp. Sta., Sta. Paper 43, 14 pp., illus. 1959.

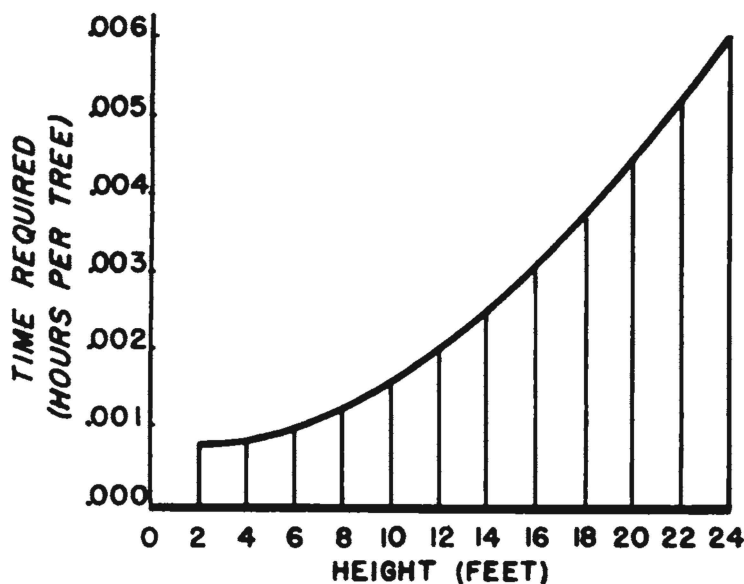


Figure 2.--Time required for burning individual juniper trees of various heights with a propane torch.

Equipment

Many types of torches can be used. A torch that produces a large flame will reduce the time required--an important factor when labor costs are high. Propane torches have been satisfactory in our studies. The oil-burning torches many ranchers have on hand are also suitable.

Precautions

Junipers should be burned only when it is certain that the fire will not escape from the planned area. If there is fuel on the ground, firebreaks should be built before the burning begins. Ordinarily, however, if the range has been at least moderately grazed, there is insufficient fuel for the fire to spread.

Weather Conditions

The main consideration on weather conditions is flexibility of operations. The best days for individual tree burning are hot and dry with little or no wind. Winds 12 miles per hour or greater blow the torch flame away from the tree without igniting the tree tops. If a particular day turns out to be too cold, wet, or windy, the burning should be postponed until the job can be done more cheaply.

How to Burn

Perhaps the most troublesome question in individual tree burning is: How much burning time is required? To answer this question, a study was conducted to relate the appearance of the trees immediately after burning to the survival of the trees 1 year later. Leaf scorch is easy to identify on a newly burned tree, and was the most useful indicator of mortality we found. Plant kill was satisfactory when 60 percent or more of the tree crown was scorched (fig. 3). The emphasis in procedure should be to get enough crown scorch without spending excessive time on the trees.

We also inspected the apparent amount of stem burning. It is very difficult to girdle a tree with flame, and we have found that amount of stem burning is poorly related to plant kill.

Figure 4 shows an ideal burn. The operator has scorched about two-thirds of the tree and stopped the flame. Figure 5 shows two wrong techniques. The operator is taking too much time with the small tree in the foreground, while the tree just behind him has been inadequately burned and will survive.

In spite of the apparent difficulties, most torch operators soon develop a "feel" for the proper amount of burning and naturally accomplish the job in nearly optimum time.

Figure 3.--Top kill and plant kill of trees, based on percent of leaf scorch apparent just after burning. Each point represents five trees.

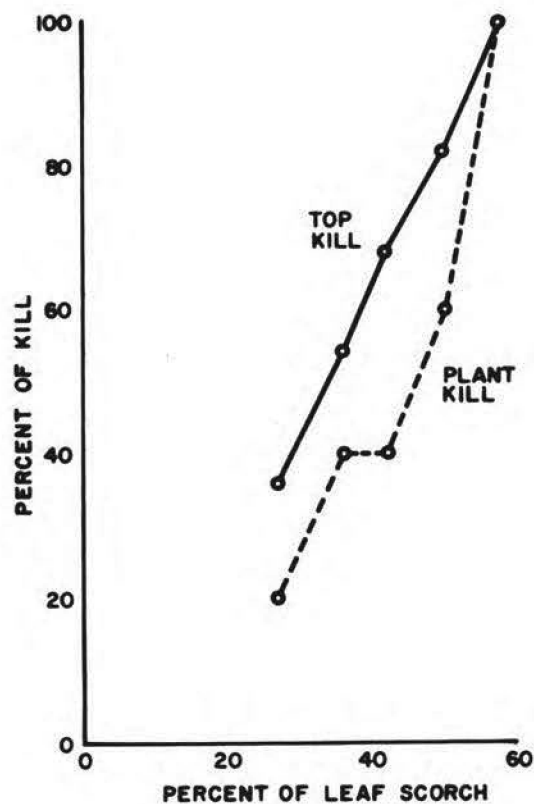


Figure 4.--Ideal burning technique. About two-thirds of the crown has been scorched.



Figure 5.--Improper burning techniques. Excessive time is being taken with the tree in the foreground. The tree behind the operator has been inadequately burned and will live.

Expected Costs and Contract Specifications

Expected time required for individual tree burning can be calculated by adding the travel time per acre (fig. 1) to the time required to burn all the trees per acre (fig. 2). For example, a stand of 100 trees 10 feet tall would take two men 0.113 hour for travel and $0.0047 \times 100 = 0.47$ hour for burning, for a total of 0.583 hour. Fuel costs are calculated

for burning time only. The torches we have studied use 20.5 gallons of propane per hour. For 0.47 hour of burning, fuel consumption would be $20.5 \times 0.47 = 9.6$ gallons.

For contract jobs, acceptable work can be evaluated by using figure 3. Sixty percent or more crown scorch should give nearly 100 percent tree mortality. Scorch can be evaluated as soon as the trees have cooled.